

106 located at the distal end of the barrel with an annular space 107 between the syringe tip and the luer connection, a plunger rod 108 with a distal end 110 and a piston member 112 on the distal end of the plunger rod and a passageway 114 that extends through the syringe tip and into the barrel. Syringe tip 104 may be a slightly tapered conical tip.

Once a fluid sample is contained in syringe 100, tip cap 20 is removably secured to syringe 100. The tip cap is screwed onto the luer connection of the syringe whereby the luer connection progressively moves in communication with strips 63, plug 40 moves into communication with the conical tip of the syringe and the luer connection fits into first annular space 72. The movement of the tip cap stops at a first stopping point where the top strips terminate and before the bottom strips begin and at first end 44 of the plug. This first stopping point is easily felt by the user and indicates to the user that a venting position has been reached and that before the cap is removably secured to the syringe, the user should try and remove excess air bubbles from the fluid sample.

At this first stopping position, the user points the syringe tip with the tip cap upwardly whereby the user gently taps the barrel of the syringe to move air bubbles from the fluid sample to the tip of the syringe. The user then gently depresses the plunger so that air bubbles contained within the sample will be expelled through the tip cap via indents 52 of plug 40. When substantially all of the trapped air has been expelled, a resistance to further depress the plunger will be felt by the user, which is an indication that the syringe has been vented.

Then the user proceeds to continue screwing the cap fully onto the syringe, whereby the luer connection further cooperates with the bottom strips on the primary ring and the planar surfaces provide a friction fit with the conically tapered tip of the syringe, whereby the primary is gradually urged into tight engagement with the outer surface of the conically tapered tip. The plug achieves a scaling of the passageway through the tip, whereby the plug fits snugly in the passageway of the syringe tip and with bottom end 48 of the plug thereby indicating to the user that the tip cap is securely engaged with the syringe. The removably secured arrangement of the tip cap and the syringe is shown in FIGS. 4 and 5.

As shown in FIGS. 4 and 5, flats 54 are positioned on the outer wall surface of annular skirt 30. The flats substantially prevent the cap from rolling and provide a convenient grasping surface for ready removal and placement of the cap on the syringe. Although a smooth outer circumference without flats is within the purview of the instant invention, a cap with an outer surface with flats is preferred. In addition, outer end wall 24 of cap 20 is flat to allow the syringe when connected to the tip cap to be placed on a flat surface unattended, in an upright position thereby allowing ease of manipulation of the syringe by the user.

The tip cap of the invention may be made of a clear molded thermoplastic material so that the syringe tip may be readily viewed in the tip cap. Representative materials include, for example, polyethylene, polypropylene and polyvinyl chloride. Although it is within the purview of the invention to provide caps which are transparent, it is within the purview of this invention to provide caps which are color coded for defining the kind of examination to be conducted on the specimen collected.

The syringe may incorporate a hydrophilic material or a silicon may be applied to the internal surface thereof for enhancing the flow of blood introduced into the syringe.

What is claimed is:

1. A tip cap for sealingly covering the distal end of a syringe comprising:

a cylindrical housing having a bottom portion comprising an inner end wall and an outer end wall, a top portion comprising a rim and an annular skirt extending from said top portion to said bottom portion having an inner surface and an outer surface and means for venting air from said syringe and for providing tactile means to the user that said syringe has been vented by said tip cap.

2. The tip cap of claim 1, wherein said means for venting is an inner plug that projects proximally from said inner end wall of said bottom portion.

3. The tip cap of claim 2, further comprising an intermediate wall projecting proximally from said inner end wall of said bottom portion and spaced in surrounding relationship to said plug.

4. The tip cap of claim 3, wherein said intermediate wall comprises an outer surface that is substantially cylindrical and an inner surface that is defined by intersecting planar surfaces.

5. The tip cap of claim 4, wherein said inner surface of said intermediate wall is substantially a hexagonal cross-section.

6. The tip cap of claim 5, wherein said outer surface of said intermediate wall comprises vertical interference strips.

7. The tip cap of claim 6, wherein said interference strips comprise a first position to indicate a first venting position to the user and a second position to indicate to the user that said tip cap and said syringe are removably secure.

8. The tip cap of claim 7, further comprising a generally cylindrical internal sealing ring extending from said inner surface of said annular skirt and said inner end wall of said bottom portion.

9. The tip cap of claim 8, wherein said internal sealing ring comprises an inner wall surface and an outer wall surface.

10. The tip cap of claim 9, wherein said internal sealing ring is separated from said outer surface of said intermediate wall by a first annular space.

11. The tip cap of claim 10, further comprising a second annular space between said inner surface of said annular skirt and said inner wall surface of said internal sealing ring.

12. The tip cap of claim 11, further comprising indentations on said inner wall surface of said internal sealing ring.

13. A syringe assembly comprising:

a syringe comprising a barrel, a syringe tip, a luer connection, a needle and a plunger rod with a piston member on the distal end of said plunger rod; and

a tip cap over said distal end of said syringe barrel comprising a cylindrical housing having a bottom portion comprising an inner end wall and an outer end wall, a top portion comprising a rim and an annular skirt extending from said top portion to said bottom portion having an inner surface and an outer surface and means for venting air from said syringe and for providing tactile means to the user that said syringe has been vented by said tip cap.

14. The assembly of claim 13, wherein said means for venting is an inner plug that projects proximally from said inner end wall of said bottom portion.

15. The assembly of claim 14, further comprising an intermediate wall projecting proximally from said inner end wall of said bottom portion and spaced in surrounding relationship to said plug.

16. The assembly of claim 15, wherein said intermediate wall comprises an outer surface that is substantially cylin-

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dricul and an inner surface that is defined by intersecting planar surfaces.

17. The assembly of claim 16, wherein said inner surface of said intermediate wall is substantially a hexagonal cross-section.

18. The assembly of claim 17, wherein said outer surface of said intermediate wall comprises vertical interference strips.

19. The assembly of claim 18, wherein said interference strips comprise a first position to indicate a first venting position to the user and a second position to indicate to the user that said tip cap and said syringe are removably secure.

20. The assembly of claim 19, further comprising a generally cylindrical internal sealing ring extending from said inner surface of said annular skirt and said inner end wall of said bottom portion.

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21. The assembly of claim 20, wherein said internal sealing ring comprises an inner wall surface and an outer wall surface.

22. The assembly of claim 21, wherein said internal sealing ring is separated from said outer surface of said intermediate wall by a first annular space.

23. The assembly of claim 22, further comprising a second annular space between said inner surface of said annular skirt and said inner wall surface of said internal sealing ring.

24. The assembly of claim 23, further comprising indentations on said inner wall surface of said internal sealing ring.

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